

SM-416-84
9 July 1984

MEMORANDUM FOR: Chief of Staff, US Army
Chief of Naval Operations
Chief of Staff, US Air Force
Commandant of the Marine Corps
Director, Defense Communications Agency
Director, Defense Intelligence Agency
Director, Defense Nuclear Agency
Director, National Security Agency/Chief,
Central Security Service

Subject: The Use of Space Systems in Threat Environments (U)

1. (U) This memorandum supersedes SM-467-76, 9 June 1976, "Hardening of Military Satellites Against the Effects of Nuclear Weapons (U)."

2. (U) The Appendix establishes uniform procedures for use by sponsors of military space systems (i.e., the Services and DOD agencies) in developing performance specifications and threat-environment criteria that will optimize these systems' survivability and endurance against both nuclear and nonnuclear threats.

3. (U) Military space systems are an integral element of the force structure, supporting the full range of military operations and the C3 requirements of the NCA.

[REDACTED]

4. (U) Because of the diversity and evolutionary changes of space systems, their missions, and the nature of the threat, a single, universal set of minimum protective measures is not possible. Therefore, space-system sponsors must determine performance specifications and environmental criteria on a system-by-system basis. To insure the [REDACTED] sponsors will insure that the [REDACTED]

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[REDACTED] are addressed and performance specifications determined. Further, because the [REDACTED] these specifications and criteria must be supplemented, as necessary, by the [REDACTED]

For the Joint Chiefs of Staff:

Donald W. Williams

DONALD W. WILLIAMS
Colonel, USA
Secretary

Attachment

Reference:

* Memorandum by the Secretary of Defense, 22 June 1982,
"Department of Defense Space Policy"

Copy to:

Director, CIA
Administrator, NASA

APPENDIX

GUIDELINES FOR PROTECTING MILITARY SPACE
SYSTEMS IN THREAT ENVIRONMENTS (U)

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.. (S) General. DOD has established policy that military
pace systems, including all essential ground elements as well
s orbiting spacecraft, will be designed, developed, and
perated so as to

[REDACTED]

The diversity of space system missions,
onfigurations, employment options, and threat environments
cludes the establishment of a single criterion for all
stems. The guidelines that follow focus on protective
asures for the complete space system.

(S) Procedures. Each deployed military space system must
capable of

[REDACTED]

to accomplish its designated mission. In conjunction
th other concerned DOD components, the sponsors of specific
ace systems will, during concept formulation, translate
rformance requirements for the satellite, propagation links,
i ground elements into criteria.

[REDACTED]

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When measures other than [REDACTED]

[REDACTED] must be employed to [REDACTED]

[REDACTED] of system elements [REDACTED]

[REDACTED] the design criteria will be

determined by the [REDACTED]

alone is not sufficient to [REDACTED]

In conjunction with [REDACTED] other [REDACTED]

[REDACTED] are required. Specific [REDACTED] should

be developed on a system-by-system basis taking into account [REDACTED]

[REDACTED] and cost. These criteria will be

substantiated during the validation phase of development and established by the sponsor when the satellite system goes into full-scale engineering development. Before system acquisition review is begun, the sponsor will inform the Chairman, Joint Chiefs of Staff, concerning the [REDACTED]

[REDACTED] that are required, in [REDACTED]

and will provide the associated rationale. This information will assist the Chairman, Joint Chiefs of Staff, in exercising his role as adviser to the Defense Systems Acquisition Review Council.

3. (U) Threat Definition. The criteria developed by the sponsor must be based on the intelligence community's best

estimate of the nature of the hostile force likely to be encountered and of the hostile capabilities that will be technically feasible over the lifetime of the system. The sponsor should combine this information with a generalized mission profile in order to develop credible mission scenarios that will be coordinated with the user, developer, and intelligence community. The resulting data will be compiled in a system threat document that will be validated by the Joint Chiefs of Staff.

4. (U) Criteria Development. Nuclear and nonnuclear environments must be calculated for the scenarios developed in the threat document, and possible effects on systems exposed to these environments will be evaluated. Trade-offs between hardness levels and costs must also be evaluated, along with the sensitivity of the environment to changes or excursions in the threat. Trade-offs between the survivability enhancements (hardening, proliferation, etc.) and expected uses of the system must also be evaluated. In some situations, minor changes in positioning or tactics may have a greater survivability payoff than increasing nuclear, directed energy, radio frequency, or microwave hardening. Based on such analyses, realistic combinations of nuclear and nonnuclear weapons effects, as well as the nature of hostile

ECM environments, must be evaluated to determine protection
criteria. The rationales for these criteria should also
include inherent system endurance, life cycle cost, technical
state of the art, and operational constraints. The hardness,
survivability, and endurance levels, specified in terms of the
nuclear and nonnuclear environments, must be submitted for
validation by the Joint Chiefs of Staff.

5. (U) Verification of Hardness Levels. The formulation,
funding, and operation of a space system hardening test and
verification program is the responsibility of the sponsor.
The sponsor must make the best use of available analytical and
testing methods and facilities to provide strong confidence in
the design hardness levels established. The sponsor will
inform the Chairman, Joint Chiefs of Staff, of the verified
hardness levels for each space system and the verification
method used.

6. (U) Maintenance and Assurance Program. The system sponsor
will develop and conduct a maintenance and assurance program
to insure that the system's protective measures will not
degrade with time but will allow the system to continue to
function in the threat environments in sufficient numbers, for
a long enough duration, and with adequate capability to

accomplish its designated mission. The survivability and endurance requirements are standards against which system performance must be evaluated. All survivability enhancement methods used to protect the system must be evaluated for continuing effectiveness. The effects on the system of aging, changes in the threat, and changes in mission must all be taken into account. If specified levels of performance cannot be maintained, the sponsor must notify the Joint Chiefs of Staff and describe the action being taken to restructure the system's operational concept or to obtain a replacement system.

7. (S) [REDACTED] For

Mission-Critical Space System Elements. To maximize

[REDACTED] space system elements will be [REDACTED]

The [REDACTED] For

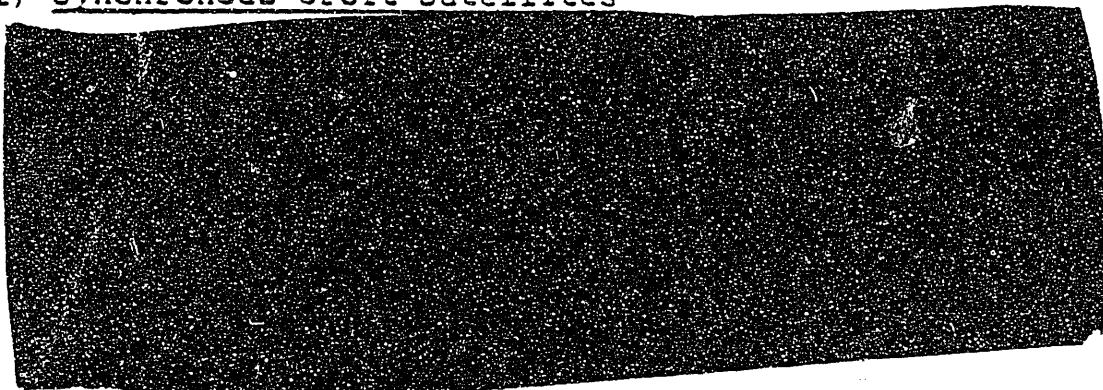
defining [REDACTED] follow. They will be used, as necessary, to supplement the environmental criteria developed in accordance with the guidelines given in paragraph 4 above.

a. (S) Ground Element. [REDACTED]

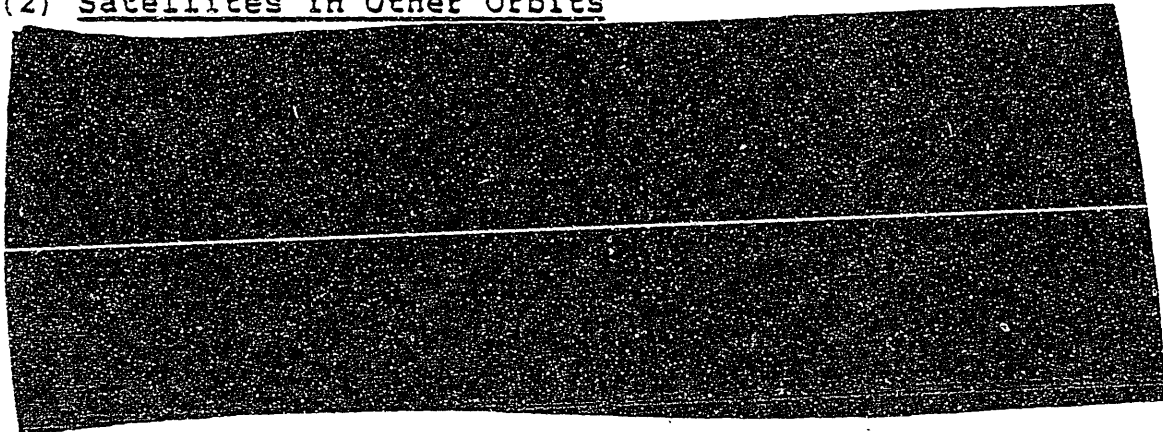
b. (U) Propagation Path. Scintillation and Absorption Environment: Refer to DNA 5662D, 31 December 1980, "A Trans-Ionospheric Signal Specification for Satellite C3 Application (U)," and DNA-IR-82-01, 4 April 1982, "A Reasonable Worst Case Specification of Nuclear Disturbed Radio Signals (U)."

c. ~~(S)~~ Satellite Segment

(1) Synchronous-Orbit Satellites



(2) Satellites in Other Orbits



* JCASM-47-84, 16 February 1984, "High-Altitude Electromagnetic Pulse Environment and Protection Criteria"